

PLANT AND SOIL SCIENCE

Plant and Soil Science is a two semester course that provides students with opportunities to participate in a variety of activities including laboratory work. Topics covered include: the taxonomy of plants, the various plant components and their functions, plant growth, plant reproduction and propagation, photosynthesis and respiration, environmental factors affecting plant growth, diseases and pests of plants and their management, biotechnology, the basic components and types of soil, calculation of fertilizer application rates and procedures for application, soil tillage and conservation, irrigation and drainage, land measurement, cropping systems, precision agriculture, principles and benefits of global positioning systems, harvesting, and career opportunities in the field of plant and soil science.

Course Specifications

- DOE Code: 5170
- Recommended Grade Level: Grade 9-12
- Recommended Prerequisites: Introduction to Agriculture, Food and Natural Resources
- Credits: 1 credit per semester, maximum of 2 credits
- Fulfills a Life Science or Physical Science requirement for the General Diploma only or counts as a Directed Elective or Elective for the General, Core 40, Core 40 with Academic Honors and Core 40 with Technical Honors diplomas

Career and Technical Student Organizations (CTSOs)

Career and Technical Student Organizations are considered a powerful instructional tool when integrated into Career and Technical Education programs. They enhance the knowledge and skills students learn in a course by allowing a student to participate in a unique program of career and leadership development. Students should be encouraged to participate in FFA, the CTSO for this area.

Content Standards

Domain - Classifying

Core Standard 1 Students classify agricultural plants according to taxonomy systems.

Standards

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| PSS-1.1 | Explain systems used to classify plants |
| PSS-1.2 | Compare, contrast, and classify agricultural plants according to the hierarchical classification system, life cycles, plant use and as monocotyledons or dicotyledons |
| PSS-1.3 | Describe the morphological characteristics used to identify agricultural plants |

Domain - Plant Reproduction

Core Standard 2 Students analyze the germination of plants and plant reproduction to successfully grow and propagate plants.

Standards

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| PSS-2.1 | Explain pollination, cross-pollination and self-pollination of flowering plants |
| PSS-2.2 | Diagram the process of plant fertilization |
| PSS-2.3 | Design and implement a plan to control the pollination of plants |
| PSS-2.4 | Demonstrate sowing techniques and provide favorable conditions for seed germination |
| PSS-2.5 | Conduct tests associated with seed germination rates, viability and vigo |
| PSS-2.6 | Describe optimal conditions for asexual propagation and demonstrate techniques used to propagate plants by cuttings, division, separation and layering. |

PSS-2.7 Evaluate asexual propagation practices based on productivity and efficiency

Domain - Environmental Factors

Core Standard 3 Students evaluate the environmental factors affecting plant growth to productively cultivate plants.

Standards

- PSS-3.1 Describe the effects air, temperature, and water have on plant metabolism and growth
- PSS-3.2 Determine the optimal air, temperature and water conditions for plant growth
- PSS-3.3 Design, implement and evaluate a plan to maintain optimal conditions for plant growth
- PSS-3.4 Describe the qualities of light that affect plant growth
- PSS-3.5 Describe plant responses to light color, intensity and duration
- PSS-3.6 Evaluate plant responses to varied light color, intensity and duration

Domain - Plants Cells

Core Standard 4 Students differentiate plant cell parts and functions as they apply to cell physiology and reproduction.

Standards

- PSS-4.1 Diagram a typical plant cell and identify plant cell organelles and their functions
- PSS-4.2 Compare and contrast mitosis and meiosis
- PSS-4.3 Apply the knowledge of cell differentiation and the functions of the major types of cells to plant systems

Domain - Plant Structure and Function

Core Standard 5 Students establish knowledge of plant parts and functions to successfully cultivate plants for the food, fiber, and natural resource industry.

Standard

- PSS-5.1 Identify the components, the types and the functions of plant roots
- PSS-5.2 Identify the components and the functions of plant stems
- PSS-5.3 Describe the processes of translocation
- PSS-5.4 Discuss leaf morphology and the functions of leaves
- PSS-5.5 Explain how leaves capture light energy and allow for the exchange of gases
- PSS-5.6 Explain the relationships between leaf structure and functions and plant management practices
- PSS-5.7 Identify the components of a flower, the functions of a flower and the functions of flower components
- PSS-5.8 Apply the knowledge of flower structures to plant breeding, production and use
- PSS-5.9 Explain the functions and components of seeds and fruit
- PSS-5.10 Apply the knowledge of seed and fruit structures to plant culture and use

Domain - Energy Synthesis

Core Standard 6 Students apply and adapt photosynthesis and respiration in plants to make decisions on plant production.

Standards

- PSS-6.1 Explain the basic process of photosynthesis and its importance to life on Earth
- PSS-6.2 Explain requirements necessary for photosynthesis to occur and identify the products and byproducts of photosynthesis
- PSS-6.3 Explain the light-dependent and light-independent reactions that occur during photosynthesis and apply the knowledge to plant management
- PSS-6.4 Explain cellular respiration and its importance to plant life
- PSS-6.5 Explain factors that affect cellular respiration and identify the products and

byproducts of cellular respiration

Domain - Plant Pests

Core Standard 7 Students establish pest control measures to minimize the impact on agronomic crops.

Standards

- PSS-7.1 Identify types of plant pests and disorders
- PSS-7.2 Identify major local weeds, insect pests and infectious and noninfectious plant diseases
- PSS-7.3 Describe damage caused by plant pests and diseases
- PSS-7.4 Diagram the life cycles of major plant pests and diseases
- PSS-7.5 Describe pest control strategies associated with integrated pest management
- PSS-7.6 Describe types of pesticide controls and formulations
- PSS-7.7 Employ pest management strategies to manage pest populations, assess the effectiveness of the plan and adjust the plan as needed
- PSS-7.8 Explain risks and benefits associated with the materials and methods used in plant pest management
- PSS-7.9 Evaluate environmental and consumer concerns regarding pest management strategies

Domain - Cropping Systems

Core Standard 8 Students apply principles and practices of cropping systems to plant production to recommend the ideal system for their local community.

Standards

- PSS-8.1 Explain sustainable agriculture and objectives associated with the strategy
- PSS-8.2 Describe sustainable agriculture practices and compare the ecological effects of traditional agricultural practices with those of sustainable agriculture
- PSS-8.3 Prepare a plan for an agricultural enterprise that involves practices in support of sustainable agriculture

Domain - Harvesting Crops

Core Standard 9 Students apply concepts of harvesting crops to optimize yield.

Standards

- PSS-9.1 Identify harvesting methods and harvesting equipment
- PSS-9.2 Assess the stage of growth to determine crop maturity or salability and determine the proper harvesting techniques
- PSS-9.3 Explain reasons for calculating crop yield and loss

Domain - Land measurement

Core Standard 10 Students integrate the various methods of land mapping and measurement using appropriate technology to make decisions for crop management.

Standards

- PSS-10.1 Explain the importance of surveying and mapping
- PSS-10.2 Explain surveying and mapping principles
- PSS-10.3 Create and apply maps using GIS/GPS systems

Domain - Tillage Practices

Core Standard 11 Students evaluate tillage practices to determine those necessary to keep soil productive.

Standards

- PSS-11.1 Relate the several factors that contribute to soil compaction
- PSS-11.2 Evaluate the various methods of land preparation and seeding based on soil and plant characteristics
- PSS-11.3 Describe the visible effects of soil compaction on plants and the effects it has on soil
- PSS-11.4 Discuss the advantages and disadvantages of incorporating crop residues or manures into the soil

Domain - Soil Properties

Core Standard 12 Students analyze the physical properties of soil to determine crop selection, cropping practices, drainage, and soil conservation.

Standards

- PSS-12.1 Demonstrate techniques used to identify soil types
- PSS-12.2 Report examples of how humans are dependent upon soil, directly or indirectly, for their food, clothing and shelter
- PSS-12.3 Describe how the basic components of a soil influence its possible uses
- PSS-12.4 Investigate the properties of soil including, color, texture, drainage, parent material, organic matter, bulk density, water holding capacity, porosity and slope
- PSS-12.5 Explain the process of soil formation through weathering
- PSS-12.6 Describe the biodiversity found in soil and the contribution of biodiversity to the physical and chemical characteristics of soil
- PSS-12.7 Identify the physical qualities of the soil that determine its use

Domain - Soil Fertility

Core Standard 13 Students connect soil nutrients and soil management to promote healthy plant growth.

Standards

- PSS-13.1 Identify the essential nutrients in the soil for plant growth and development and their major functions
- PSS-13.2 Calculate the content of N-P-K in a fertilizer container from information on the package and calculate the amount of nitrogen needed for an acre of a crop using a selected nitrogen source
- PSS-13.3 Describe nutrient deficiency symptoms and recognize environmental causes of nutrient deficiencies.
- PSS-13.4 Contrast pH and cation exchange capacity between mineral soil and soilless growing media

Domain - Soil Water

Core Standard 14 Students evaluate soil and water relationships to encourage optimum plant growth.

Standards

- PSS-14.1 Identify the categories of soil water
- PSS-14.2 Discuss how soil drainage and water holding capacity can be improved
- PSS-14.3 Explain how the physical qualities of the soil influence the infiltration and percolation of water and nutrients
- PSS-14.4 Describe properties of watersheds and identify the boundaries of local watersheds

Domain - Soil Conservation Practices

Core Standard 15 Students apply and adapt the soil conservation practices necessary to keep soil

productive.

Standards

- PSS-15.1 Propose management practices and cropping systems when given features and land capabilities that would help improve the usefulness of the land
- PSS-15.2 Analyze affects of water and mechanical practices on erosion
- PSS-15.3 Explain how the programs and services provided by the soil conservation service contribute to successful soil management
- PSS-15.4 Calculate soil loss using the universal soil loss equation
- PSS-15.5 Measure slope and explain the relationship between steepness of slope and erosion

Domain - Careers

Core Standard 16 Students examine the scope of career opportunities in and the importance of agriculture to the economy.

Standards

- PSS-16.1 Define and explore plant and soil agriculture and plant and soil agribusinesses and their role in the economy
- PSS-16.2 Evaluate and explore the plant and soil career opportunities in agriculture
- PSS-16.3 Identify how key organizational structures and processes affect organizational performance and the quality of products and services
- PSS-16.4 Demonstrate those qualities, attributes and skills necessary to succeed in, or further prepare for, a chosen career while effectively contributing to society

Domain - Leadership

Core Standard 17 Students validate the necessity of leadership skills development in conjunction with participation in The National FFA Organization (FFA) as a critical component to a well-rounded agricultural education.

Standards

- PSS-17.1 Acquire and demonstrate communication skills such as writing, public speaking, and listening while refining oral, written, and verbal skills
- PSS-17.2 Recognize and explain the role of the FFA in the development of leadership, education, employability, communications and human relations skills
- PSS-17.3 Examine roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment
- PSS-17.4 Acquire the skills necessary to positively influence others
- PSS-17.5 Develop a skill set to enhance the positive evolution of the whole person

Domain - Supervised Agriculture Experience

Core Standard 18 Students validate the necessity of a Supervised Agricultural Experience (SAE) program as a critical component to a well-rounded agricultural education.

Standards

- PSS-18.1 Explain the nature of and become familiar with those terms related to an SAE program
- PSS-18.2 Explore the numerous possibilities for an SAE program which a student might develop
- PSS-18.3 Develop an individual SAE program and implement record keeping skills